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progress since accomplished, not only in biology, but in all the physical sciences.

It is good fortune for a research establishment to have been founded during the course of this progress and to be able to take part in it; and although the publications of the institution are not restricted to any domain of learning, a considerable number of them bear directly or indirectly on this profoundly interesting and increasingly important problem of "the physical basis of life." The past year has been unusually productive in this line, for no less than a dozen volumes have been added to the institution's series of contributions to evolution, heredity, and the application of thermodynamics to the interpretation of metabolism in man. These contributions are particularly noteworthy also for the extent to which cooperation has been required, since more than twenty authors and more than twice that number of collaborators are represented in the dozen volumes referred to.

THE SIGNIFICANCE OF THE DECLINING BIRTH-RATE

—A REPLY¹

MEMBERS of Section I in attendance at the meeting last year will recall the address of the retiring vice-president and chairman of the section. This meeting offers a suitable opportunity to present at least one of the replies which such an address might be expected to call forth.

Seventy per cent. of Mr. Dublin's paper was occupied with statistics, and these we may accept as coming from an expert statistician. It is the remaining thirty per cent.—embodying the author's view of the *significance* of the declining birth-rate—that invites attention.

To begin with, I hardly need point out the necessity of recognizing the prevalence of multiple and compound causes in all fields of social phenomena. When a compound cause has been disentangled from a mass of observations its individual factors must be care-

¹ Read before Section I (Social and Economic Science) of the American Association for the Advancement of Science, Baltimore, December 27, 1918.

fully weighted in order to give proper prominence to the chief one. Mr. Dublin arraigns the women and their education for the declining birth-rate. In so doing he involves himself in a significant concession; and one wonders how, with so much of a clue, he has failed to perceive the true interpretation of the social feature which he deplores. He has fixed his attention on very minor and limited causes only to lose sight of the great generic cause.

For we are to-day in the midst of a revolution quite unparalleled in the history of the human race—whether it be viewed as regards the number of persons concerned, or the length of its preparatory prelude, or the importance of the consequences which will undoubtedly follow it. I refer to the movement connected with the discovery that women, in spite of being females, are primarily human beings, with the same desires for freedom and self-direction, the same ranges in tastes and abilities and ambitions, that men have. This discovery is due to woman's recently acquired opportunity for knowledge and opportunity for economic self-dependence. These opportunities themselves seem to be involved first as effects and then as causes in modern human progress. The evolution of society—civilization itself—had proceeded as far as it could, with the archaic status of woman unmodified.

Folklore and literature from earliest times to very recent days have been charged with positive expressions of the place and duty of the female. Radical writers and conservative ones alike, teachers, philosophers, statesmen and poets, have—with few exceptions—been agreed that that place was home and that duty the care of the home and the rearing of children. Very naturally all schemes of government and all systems of theology have been in harmony with this popular conviction. To cook a thousand meals a year, to make beds and wash dishes a thousand times a year, to bear children—always to bear children—in meekness and resignation, has been held to be the woman's lot as ordered by Providence or at least by Nature. What else could a normal woman want to do?

If reiteration could save a doctrine or confer the attribute of truth this doctrine would not now be moving to join its companion superstitions: Special Creation and the Fall of Man. The savage with his savage job of hunting and fighting made the inferences that might be expected from a primitive mind regarding the creature who staid at home to cook his food and care for his child: one who could not—or at least did not—fight was inferior. The reasoning of post-savage and post-barbarous peoples is an extraordinary mass of testimony to the slowness with which the human mind has advanced to scientific aptitude. Philosophers, theologians and statesmen—no less than common persons—have failed to perceive that *no conclusions based on observations of unfree human subjects can safely be drawn regarding what is normal in those subjects*. Failure to recognize this principle accounts for the surprise, the dismay and the disapproval upon witnessing among free woman what is apparently most unnatural behavior; that is, behavior inconsistent with the normal or type-form as it had been understood.

In the United States, as late as 1850, women—being without other means of securing food, clothing and shelter—married on terms not of their own making. They bore children according to the pleasure of those whom they were to obey and in recognition of a dogma of theology which they were taught to hold as divinely endorsed. For, lacking knowledge, women were no more free in mind than they were in body lacking economic independence. This type of woman has practically disappeared below the historical horizon—succeeded by a multitude of women of affairs, in gainful occupations, in the activities of business, philanthropy, education, professions and in concerns that require the highest order of organizing and administrative ability—women who offer no apology for their choices and no defense of their activities.

Now, the most noticeable consequence of the new freedom is that each woman is deciding for herself whether she will marry or not. And in case she does marry, the

deciding vote as to the number of children to follow is likely to rest with her. The woman of to-day will herself determine what her duty is in the case. We may reason with our equals or appeal to them; but for one person to tell another grown-up person his duty, or for one class of persons to dictate the duties of another class, seems now to be unsustained by ethical courtesy. Justice has reached the point of insisting that as regards bearing many or any children a woman must be free to decide—free from the coercion of government, or religion, or public opinion, or a disordered conscience.

That "revolution" is not too strong a word to mark what has taken place in two incomplete decades of the twentieth century is well indicated by comparing the war-time position of women in the past with that of the present. The lady of the nineteenth century and all preceding ones waited and wept at home and prayed for her lord's safe return from the wars. To-day history takes into her keeping the story of the multiple *Entente* of women who helped to win the Great War. The sudden need that women should come out of the home and lend a hand in a hundred ways has led to an unexpected and perhaps unwelcome proof of what they will usually do as free persons. No doubt there are those who find consolation in the thought that women's war activities have been a spasmodic though commendable expression of patriotism, a temporary estrangement from their true work and, the war over, they will return to their "normal" place: the home. It may readily be admitted that the new freedom is too new to permit of immediate conclusions. Sociology no less than geology or physiology or any other science requires us to suspend judgment. All that can be asked on the one hand, all that need be granted on the other, is that in the great laboratory which we call human society the class investigated, the women, shall be free. A provisional judgment is that while many women will probably prefer to devote themselves to domestic activities, many others will be equally inclined—and resolved—to occupy themselves with the varied pursuits which have hitherto

been claimed by men alone. The statistics of the Census of 1920 will contribute much to the discussion. Meanwhile it must be disconcerting to reactionary persons to observe how many young women are disposed to do the very thing for which young men are commended; namely, to select a line of work and carry it through to success.

But the declining birth-rate. If n is the number of births per thousand per year and n' the number of deaths per thousand per year of children, say under one year of age, $n-n'$ is the effective birth-rate. Obviously this can be raised by increasing n or by diminishing n' . To increase n has been the way of barbarism. "What if the children do die; the woman can bear plenty more." This is not the sentiment of some distant past age; for, as Francis Galton remarks, men were barbarous but yesterday.

The method of the new civilization is to decrease n' . Up to last July (1918) the Federal Children's Bureau had weighed and measured approximately six million children under six years of age. A large number were found to be undernourished; many others were victims of diseases easily remedied by proper medical attention. Under the auspices of this bureau nation-wide plans are developing to provide public health nurses, better hospital care and the conservation of milk for children. It appears also that really effective means for saving the young children involves care of the mother not only after the child's birth but also months before.

"Save 100,000 of the 300,000 children that now die annually under one year of age!" is not the slogan of a few sentimental philanthropists; it is the purpose of the national government. This federal bureau further reports that 15,000 women die annually in the United States from childbirth; and it declares that of this total most of the deaths are preventable because due to ignorance and improper care. Nothing in this world has been so cheap as child-life except mother-life.

But I now squarely challenge Mr. Dublin's fundamental assumption that a declining birth-rate is an evil. What reason does he give, what reason has anybody given, why the

hither and the uttermost parts of North America say, should forthwith be populated as rapidly and as densely as may be—even by elect stock. Why should the natural forests be so hurriedly worked into lumber and the country's non-restorable natural resources—coal, petroleum, gas and others—be exploited to the exhaustion point? Has the United States any grounds for felicitating herself on the fact that she is burning coal at the rate of 600,000,000 tons per year? And how many years may she expect to continue such self-felicitations? It is the crudest form of collective selfishness for any one generation to act as if it had a final lien on the earth when at best it is only a temporary tenant, in honor bound by the highest racial ethics to consider the interests of those who follow: the peoples of distant centuries. This generation more than any which has preceded it seems bent on bequeathing an impoverished domain to its "heirs and assigns forever." "Few men really care what happens to posterity."

Your vice-chairman's protest against any decrease in the birth-rate meets rebuke also in the condition of the congested points where most of the increase in population is to find its home: the city. Are the city's streets—all of her streets—clean and attractive? Are her homes—all of her homes—sunny and sanitary? At what age do her children leave the public schools, and why do they leave? What are the hours and wages of young women in her laundries, candy-shops, stores, restaurants and factories? Are her women citizens no longer discriminated against as political outlaws? Has the city figured out a minimum of subsistence, of health, of education, of leisure, for all of her citizens? Until these questions are satisfactorily answered the "socially and economically efficient class" may well address itself to the practical task of bettering the conditions of human living rather than to an effort to state the population of the city in six figures instead of five.

Mr. Dublin's theory that the country will be saved if the afore-mentioned "socially and economically efficient" will only marry and raise large families runs counter to facts, for facts show that permanent betterment can

not be achieved by so simple a device as quantitative displacement. Indeed, society has always paid a price of defeat when it has attempted to nurture, through mere descent, a so-called better class superposed on a class of alleged inefficients. A group, *a*, socially and economically efficient has no guaranty that an offspring group, *a'*, will be likewise superior. What is "good blood" anyhow? It is that blood which manifests the skill and purpose to behave uprightly as a member of civilized society. But behavior can not be calculated in advance like the ephemeris of a comet. It lies outside the realm of any law of heredity as yet disclosed; for in the sequel the first of blood are apt to be last and the last first.

Mr. Dublin's contrast of native-born stock with foreign-born to the disadvantage of the latter is especially unjustified by facts. The most "native" of us are not so very native that we can with any propriety look with disdain on the great numbers of devoted and able citizens of the United States who happen to have been born on the east side of the Atlantic.

It is too late now to evade the business of defining "democracy." The Reconstruction Program of the British Labor Party—probably the most important document which world conditions have brought into existence during the past five years—starts us on the way to a definition by reciting that "the first condition of democracy is effective personal freedom." "Effective personal freedom" is a mocking phrase unless it means freedom to choose one's work, to choose one's forms of service, and to live one's life not hindering others and not hindered by others. Whatever it costs of traditions and prejudices and theories democracy requires now that there be no subject race, no subject class and no subject sex. Mr. Dublin does not seem to grasp this idea. He appeals to government, to religion, and to the schools, to return woman to what he believes to be her sphere. But governments, religions and schools do not originate or lead world movements; they follow and if they are wise they accept the inevitable. The movement briefly denoted by

the phrase, "freedom of women," is here because its time had come. Constitutions of governments, creeds of religions, curriculums of schools, are adjusting themselves to its requirements.

A study of the folk-customs of savage tribes has brought to light a system of tabu which amounts to strangerhood between men and women in all relations except the sex relation. The new society, the Great State, will show strangerhood replaced by comradeship. Men and women will together own the earth and together administer human affairs—all human affairs. It is plainly so written on the scroll which evolution unrolls.

ELLEN HAYES

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SCIENTIFIC SOCIETIES MEETING AT ST. LOUIS

THE following societies have indicated their intention to meet in St. Louis during Convocation Week in affiliation with the American Association for the Advancement of Science:

Mathematical Association of America.—(Missouri Section.) December 29. President, H. E. Slaught; Secretary, Professor Paul R. Rider, Washington University, St. Louis, Mo.

American Mathematical Society.—(Chicago and Southwestern Sections.) December 30 and 31. Joint session with Section A on December 30. Acting Secretary, Dr. Arnold Dresden, 2114 Vilas St., Madison, Wis.

American Federation of Teachers of the Mathematical and the Natural Sciences.—Secretary, Dr. William A. Hedrick, Central High School, Washington, D. C.

American Meteorological Society. December 29 to 31; joint meetings with Sections B and E on dates to be announced. Secretary, Dr. Charles F. Brooks, U. S. Weather Bureau, Washington, D. C.

American Physical Society.—December 30 to January 1, in joint session with Section B, President, J. S. Ames. Secretary, Dr. Dayton C. Miller, Case School of Applied Science, Cleveland, Ohio.

Society for the Promotion of Engineering Education.—President, Arthur M. Greene, Jr. Secretary, Professor Frederic L. Bishop, University of Pittsburgh, Pittsburgh, Pa.

Optical Society of America.—January 2. Presi-